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I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND
SALES hereby certify that annexed is a true copy of the Provisional specification
in connection with Application No. 2002953185 for a patent by COLIN
DUNLOP as filed on 09 December 2002.



WITNESS my hand this
Fifth day of January 2004

J.R. Yabsley

JONNE YABSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

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AUSTRALIA
Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

COLIN DUNLOP

Invention Title:

PATIENT WARMING SYSTEM

The invention is described in the following statement:

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PATIENT WARMING SYSTEM

Field of the Invention

5 The present invention relates to a warming system for patient care and, particularly, but not exclusively, to a warming system for use in veterinary care.

Background of the Invention

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There are many circumstances in human and animal medicine where it is necessary to keep a patient warm to, for example, prevent or treat hypothermia.

15 In human medicine, it is known to provide patient warming systems which include a patient warming blanket and a heating unit. The patient warming blanket includes two layers which are bonded or stitched together at a seam and are otherwise separable from each other to form a hollow space within the blanket when warm air is pumped from the heating unit via a delivery tube in between the 20 two layers. One of the layers contains a plurality of air holes which allow the pumped warm air to escape from the blanket. In operation, the patient is wrapped or covered in the warming blanket with the layer with the holes next to the patient. Warm air is pumped in from the heating 25 unit and escapes from the air holes on the inside layer of the blanket and keeps the patient warm.

These patient warming systems are designed for use in human medicine only, for the prevention and treatment of 30 hypothermia during anaesthesia and critical care.

There is, however, a similar need for a patient warming system in veterinary care. Presently, similar warming systems are used as those designed for human patients. There are a number of problems associated with 35 the use of the human patient warming system in veterinary care, however.

Small animals have a relatively large surface area to

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volume ratio, which makes them particularly susceptible to hypothermia. The applicants have found that using a conventional human warming system to maintain the body temperature of a relatively small animal can actually
5 result in cooling of the animal (which can lead to death). This occurs, we believe, because the air flow is delivered to the patient by individual, discreet holes in the inner layer of the warming blanket. In a patient with relatively large surface area to volume, delivery of air
10 from an air hole, so that the air is moving relatively rapidly, can cause the patient to chill, as the air takes away more heat from the surface of the patient than it delivers. Obviously, this is very dangerous in a critical care situation.

15 Another problem is that the heating unit used in the human systems typically only heats to a temperature of 43°C. Animals have a range of body temperatures and in many circumstances a system which provides heated air at a maximum of 43°C is not sufficient.

20 Another problem which relates to animals, which in veterinary situations are often smaller and sometimes much smaller than human beings, is that the human patient warming blankets are relatively large, and a small animal placed under one of these will not be adjacent sufficient
25 air holes to provide sufficient warm air to maintain the animal's temperature.

Further, in surgery and other circumstances where sterile conditions are required, having air blown at relatively high velocity through a small hole can result
30 in contamination of the site eg. the surgical site, via substances blown onto the surgical site by air from the air holes.

Summary of the Invention

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In accordance with a first aspect, the present invention provides a patient warming blanket comprising at

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least two layers capable of forming an air space between them for receiving warmed air from a heating unit, one of the two layers having a substantial proportion of its surface formed of porous material so that warmed air delivered to the air space escapes via the porous material over the substantial proportion of the surface of the one layer.

Delivering heat spread over the surface of the one layer, via the porous material, has the effect of evenly warming the patient without forming relatively high velocity streams of air (as in the prior art blanket where the air is delivered via discreet holes). Animals, therefore, and in particular small animals, are not at risk of being cooled by relatively high velocity air streams. The warm air is preferably delivered at relatively low velocity over the entire pre-determined surface of the one layer.

Preferably, the blanket is designed not to cover the animal patient, but instead to provide a patient receiving area in which the patient lies surrounded at least on three sides by a tube formed by the blanket when air is pumped into the air space. This has the effect of passing warm air over the patient within the space, so no matter how large the patient, the air in the space will be kept at substantially the same temperature.

Preferably, the surface of the blanket is fluid repellent, so that any liquid contamination rolls off the blanket.

In an alternative embodiment, the entire blanket may be made of porous material so that warmed air is delivered over the entire surface of the blanket that is exposed. This saves cost in manufacture of the blanket as it is only necessary to manufacture the blanket from one type of material. This can be significant, as in the majority of cases these blankets are intended to be disposable after one use.

In accordance with a second aspect, the present

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invention provides a patient warming blanket comprising at least two layers capable of forming a hollow air space between them for receiving warmed air from a heating unit, the two layers and air space being arranged in operation to form a substantially tubular arrangement at least partially surrounding a patient receiving space, whereby when warm air is passed into the air space it is delivered to the patient receiving space via the blanket, to maintain warm air within the patient receiving space.

Preferably, the tubular arrangement surrounds the patient receiving space on three sides.

One other problem with the conventional human patient warming systems is that it has been known for carers to direct heat directly from the heating unit via a delivery tube directly onto the patient. This can cause burning, particularly in small animals, and is not something that should occur.

In accordance with a third aspect, the present invention provides a heating unit for a patient warming system, the heating unit including a delivery port for delivering warmed air to a patient warming blanket, and a feedback means for determining whether a patient warming blanket is attached and being responsive to a determination that the patient warming blanket is not attached, to disable delivery of warmed air via the port.

Preferably, the feedback means comprises a pressure sensor, for sensing back pressure on the air delivery port. When a blanket is attached, there will be a certain amount of back pressure on the delivery port, so that when this back pressure is detected, air may delivered.

Preferably, the heating unit is arranged to heat air to a range of temperatures, preferably up to 46°C.

In accordance with a fourth aspect, there is provided a heating system comprising a patient warming blanket in accordance with the first aspect of the present invention and a heating unit in accordance with the third aspect of the present invention.

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Brief Description of the Drawings

Figure 1 is a plan view of a patient warming blanket
5 in accordance with one embodiment of the present
invention, shown connected to a heating unit in accordance
with one embodiment of the present invention, and

Figure 2 is a cross sectional view on line XX of
figure 1.

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Description of Preferred Embodiment

With reference to the figures, a patient warming
system in accordance with an embodiment of the present
15 invention is illustrated, particularly being designed for
use in veterinary medicine. The patient warming system
comprises a heating unit 1 (to be described in more detail
later) and a patient warming blanket 2.

The patient warming blanket 2 includes first 3 and
20 second 4 layers of material which form a hollow air space
5 between them. In this embodiment, when the warming
blanket 2 is not being used, it will lie substantially
flat as no air is being pumped into the air space 5. In
use, however, when air is being pumped into the air space
25 5, the blanket "inflates" to give the profile shown in the
cross-section of figure 2.

The first layer 3 is substantially non porous to air.
The second layer 4, however, is made of porous material
and is substantially porous over its entire surface area.
30 Warm air pumped into the hollow air space 5, therefore,
escapes via the entire surface of the second layer 4.

The warming blanket 2 may be made of any appropriate
material and in this embodiment is made from polyester.
The second surface 4 being of porous polyester.

35 The arrangement of the first 3 and second layers 4
in operation in this embodiment forms a tubular
arrangement which extends about three sides of a patient.

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receiving space 6. In this embodiment, a continuation 7 of the first layer 3 provides a blanket base on which the patient may lie.

In operation, warmed air is provided from the heating
5 unit 1 via a flexible heat delivery tube 8 into a port 9 to the interior space 5 of the blanket. The warmed air inflates the blanket to give the profile illustrated in figure 2. The patient is positioned within the patient receiving space 6. Warm air escapes via the porous second
10 layer 4 into the patient receiving space maintaining the patient receiving space 6 at a substantially even temperature. The shape of the blanket maximises the convective surface area for heating.

The material of the warming blanket 2 is treated to
15 be fluid repellent, so that any liquid contamination rolls off the blanket.

In an alternative embodiment, the blanket may consist of the same main material over all of its surface. Warmed air is therefore delivered over all of the exposed surface
20 of the blanket. This blanket may be cheaper to make.

The heating unit 1 includes the feedback means which in this embodiment is a pressure sensor. The pressure sensor is arranged to sense a certain amount of back pressure on a delivery port 10 of the heating unit which
25 delivers warmed air to the delivery tube 8. The existence of this back pressure implies that a warming blanket 2 is attached to the delivery tube 8. If the back pressure signal is not received by the pressure sensor, then delivery of warmed air 10 via the port is disabled. This
30 prevents any operative attempting to provide warmed air directly to a patient via the delivery tube 8, without using a warming blanket.

The heating unit 1 includes control and selection means that enables a selection of plurality of
35 temperatures for the warmed air, and in this embodiment warmed air can be delivered at temperatures of 34, 37, 40, 43 or 46 degrees Centigrade.

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While the above description refers to application of the warming system with animal patients, the system of the present invention is not limited to use with animal patients and can be used with human patients eg. small
5 human patients.

Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

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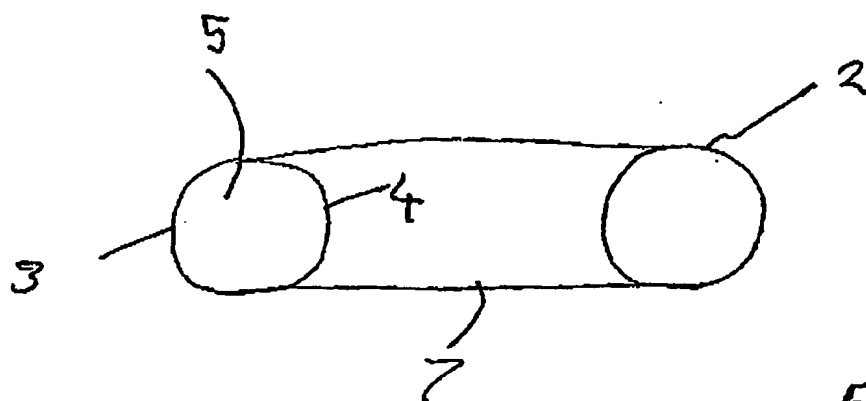
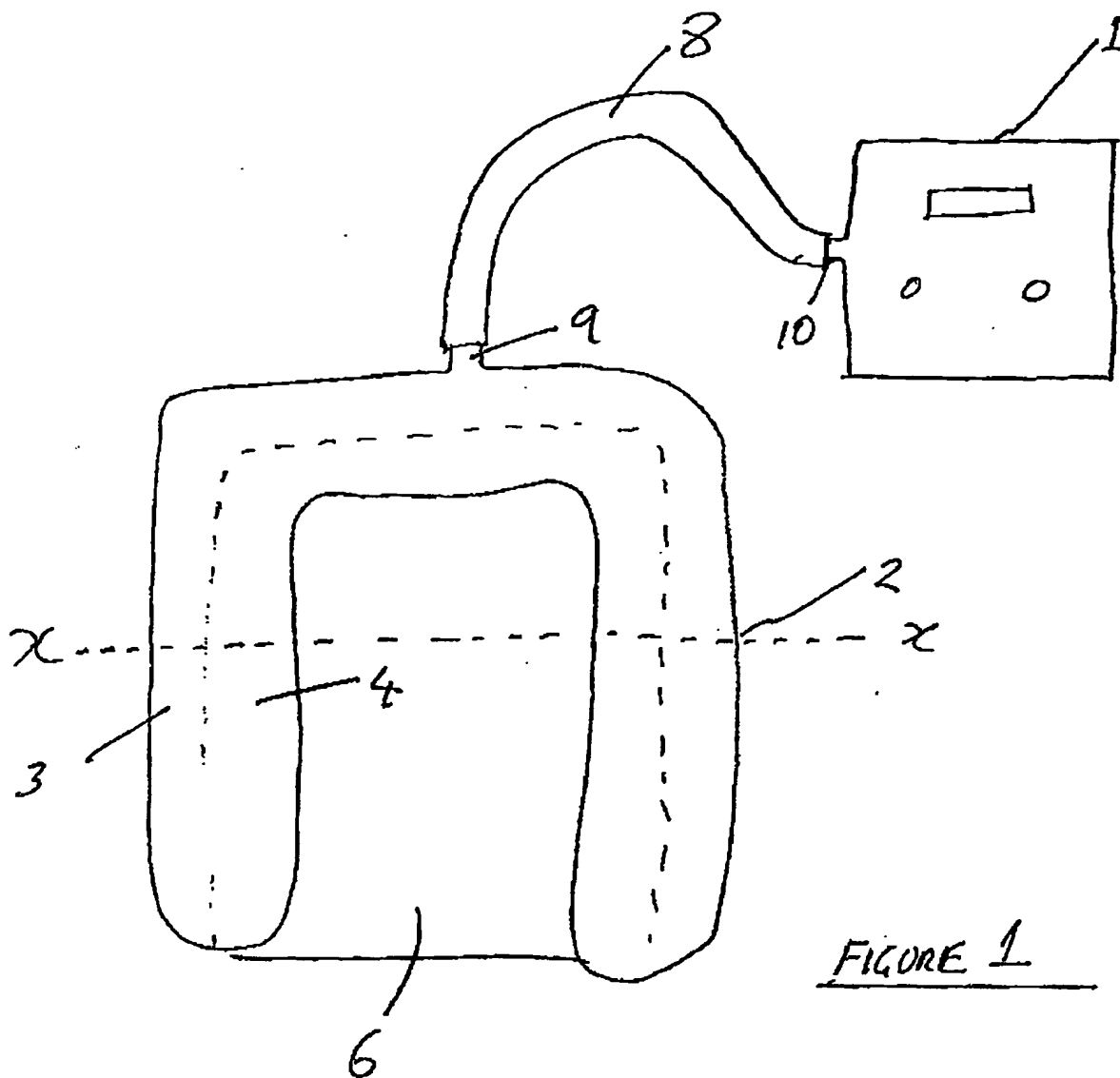
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CLAIMS

1. A patient warming blanket comprising at least two
5 layers capable of forming an air space between them for
receiving warmed air from a heating unit, one of the two
layers having a substantial proportion of its surface
formed of porous material so that warmed air delivered to
the air space escapes via the porous material over the
10 substantial proportion of the surface of the one layer.
2. A patient warming blanket in accordance with claim 1,
wherein the two layers and air space are arranged in
operation to form a substantially tubular arrangement at
least partially surrounding a patient receiving space,
15 whereby when warmed air is passed into the air space it is
delivered to the patient receiving space.
3. A patient warming blanket in accordance with claim 2,
wherein the tubular arrangement surrounds the patient
receiving space on three sides.
- 20 4. A patient warming blanket in accordance with claim 1,
2 or 3, wherein the surface of the blanket is fluid
repellent, so that liquid contamination rolls off the
surface.
5. A patient warming blanket comprising at least two
25 layers capable of forming a hollow air space between them
for receiving warmed air from a heating unit, the two
layers and air space being arranged in operation to form a
substantially tubular arrangement at least partially
surrounding a patient receiving space, whereby when warm
30 air is passed into the air space it is delivered to the
patient receiving space via the blanket, to maintain warm
air within the patient receiving space.
6. A heating unit for a patient warming system, the
heating unit including a delivery port for delivering
35 warmed air to a patient warming blanket, and a feedback
means for determining whether a patient warming blanket is
attached and responsive to a determination that the

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patient warming blanket is not attached, to disable delivery of warmed air via the port.

7. A heating unit in accordance with claim 6, wherein the feedback means includes a pressure sensor for sensing
5 back pressure on the air delivery port.

8. A heating unit in accordance with claim 6 or 7, the heating unit being arranged to heat the air to a range of temperatures.

9. A heating unit in accordance with claim 8, being
10 arranged to heat air up to 46°C.

10. A heating system comprising a patient warming blanket in accordance with any one of the claims 1 to 5 and a heating unit in accordance with any one of claims 6 to 9.

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